

Expanding on-orbit care

Human patient simulation can help train flight surgeons, astronauts for medical emergencies

By Andrew Zehr

Thanks to a computer-connected, lifelike mannequin known as the Human Patient Simulator (HPS), NASA astronauts and flight surgeons have a chance to make and learn from mistakes before they ever reach space.

"Wouldn't it be nice if life had a rewind button? If you mess up you could stop what you were doing, rewind and try it again," said Dr. Kira Bacal, NASA Medical Informatics and Health Care Systems (MIHCS). "That is what the HPS allows us to do."

The HPS fulfills NASA's need for an efficient way to train crew members for the host of medical emergencies that could occur in space.

The HPS, which was developed as an offshoot of flight simulator technology, consists of a lifelike high-fidelity mannequin that can breathe, have a pulse, open its eyes and be given any emergency drug necessary to treat or correct a medical condition. These mannequins are manufactured by Medical Education Technologies, Inc., and are currently used in medical schools and allied health programs around the world to train health care professionals.

The technology's versatility persuaded NASA to adopt the HPS for training medical flight control teams – including flight surgeons, biomedical engineers and crew medical officer astronauts – for medical emergencies on International Space Station and Space Shuttle missions.

Dr. Hal Doerr, the principal investigator of NASA's Medical Operational Support Team (MOST), said the simulator can mimic 30 different patients with 40-50 medical scenarios that feel very realistic to those in training.

"We can simulate various patients that range from a young, healthy 22-year-old active non-smoking male up to a 90-year-old, less-active diabetic female," said Doerr, who is also the head of the Houston Center for Advanced Patient Simulation at Baylor College of Medicine. "There are over 200 physiological combinations we can work with."

The MOST is a joint multi-specialty project of the National Space Biomedical Research Institute, MIHCS and Wyle Laboratories. Doerr said that collaboration between these organizations works well because members of the groups have worked together previously on space medicine projects and are able to combine and learn from their previous experiences.

The MOST uses the simulator's physiological possibilities to program "patients" that mimic the altered physiology of astronauts either during or after a flight. Doing so enables medical flight control teams to have a hands-on platform to practice management of medical conditions either on orbit or within 24 hours of return.

To maximize the utility of the HPS, NASA can also use it to evaluate medical hardware.

"It has multiple functions," said Dr. Victor Hurst IV, MIHCS Project Scientist with Wyle Laboratories and a member of the MOST. "We're expanding on-orbit health care by developing, testing and validating medical equipment and procedures with the HPS."

Although these products have been thoroughly tested on Earth, there is no guarantee that they will handle the same in space. Sending medical hardware into space can be expensive and dangerous; the HPS can minimize the risk by duplicating how a patient in space might react during a medical emergency.

"If MIHCS needs to evaluate the commercial, off-the-shelf ventilator they are modifying for use aboard the ISS, they can use the HPS as a test bed to see how it would function in a simulated space environment," Hurst said.

Minimizing the danger of testing new products in hazardous situations is a priority not only for NASA but for a variety of groups. Doerr has used patient simulators to train nurses, respiratory therapists, pharmacists, firefighters and military personnel. They are also used to prepare for situations that occur away from a health care network.

"The HPS allows education to be the focus of attention rather than the patient," Bacal said. "High-fidelity human patient simulation allows participants to learn from their mistakes until they are confident in their skills."

By using human patient simulation, the MOST expects to provide the NASA community with hands-on exposure to space-relevant medical scenarios. In doing so, the MOST anticipates this project will have an impact on present and short-term medical projects, including medical training, and facilitate long-term planning for expanding space medical care for future long-duration missions.

Medical Operational Support Team members work on the Human Patient Simulator. From left are Dr. Victor Hurst IV, Dr. Hal Doerr and Dr. Kira Bacal.

Jsc2003-00096 Photo by Bill Stafford



A long-distance chat, NASA style

Co-ops talk to Expedition 7

By Sarah Milstead and Joanne Hale

Ten NASA cooperative education students from Johnson Space Center, Boeing and other local aerospace contractors had the unique opportunity to interact directly with Expedition 7 crew members Commander Yuri Malenchenko and NASA International Space Station Science Officer Ed Lu via a live downlink to JSC's Teague Auditorium on Aug. 6.

The crew appeared on a screen by way of satellite from the International Space Station and answered questions posed by the group. Seven student interns supporting space operations at Goddard Space Flight Center in Greenbelt, Md., also participated in the out-of-this-world event.

"Speaking to the crew was a surreal experience," said Lindsay Croughn, Boeing intern. "It was very motivational – I can't wait to come back and work for the space industry."

Questions to the crew included the importance of the ISS, the effects of life in space on bones, brain chemistry and emotions, and the best ways for the next workforce generation to find jobs in the space industry.

"It's an unbelievable experience to be able to talk to someone in space in real time," said co-op Chris Thompson. "This was a great way to wrap up my summer with Boeing."

Following the hour-long chat with the ISS residents, students participated in a question-and-answer session with Expedition 7 lead Flight Director John McCullough and former NASA Chief Scientist Astronaut Shannon Lucid, Ph.D. McCullough gave a brief presentation on the makeup and future construction of the ISS, and Lucid presented an overview of the NASA organization.

"I thought the Expedition 7 co-op event was a great opportunity to reach out to the men and women who represent the future of NASA," McCullough said. "One of the great opportunities you get while you are a co-op or intern is to have diverse work experiences and see how NASA works. Speaking with the crew and hearing about our mission on the ISS first hand is truly a unique experience."

"I think that talking to the Expedition 7 crew live from orbit was a very inspiring event for the co-ops to be involved in," Lucid said. "Talking with the crew on ISS emphasized to the co-ops the importance of their endeavors at NASA."

McCullough said the bright future of NASA and the great opportunity that the event provided demonstrated the exceptional accomplishments that have taken place in the space program.

"NASA is a large family working together to achieve great things, and working with our international partners further enlarges this circle," McCullough said. "Sometimes the magnitude of our achievements is overshadowed or missed in our daily efforts, but when you step back and look at it, it is truly amazing. I think this event with the Expedition 7 crew helps remind us of the great things we are doing right now and will do in the future."



Co-op students take part in a live Q&A session with the Expedition 7 crew onboard the ISS.

Jsc2003e52159 Photo by David DeHoyos

Astronaut Dr. Shannon Lucid and Deputy Director of Education Phil West address the audience during the ISS downlink.

Jsc2003e52168 Photo by David DeHoyos

A co-op asks a question during the event, which was held in the Teague Auditorium at JSC.

Jsc2003e52170 Photo by David DeHoyos

Hispanic Heritage Month



DEBORAH ACOSTA CONDER

TIME AT JSC 20 years

ORGANIZATION Human Resources and Education Office

POSITION TITLE Manager, Exchange Operations

EDUCATION Bachelor of science in accounting from New Mexico State University; M.B.A. from University of Houston - Clear Lake; Executive Certificate in public administration from Syracuse University, Maxwell School

PLACE OF BIRTH Silver City, N.M.

HOBBIES Spending time with my husband and son, golf, home improvements, reading fiction and business books, listening to contemporary jazz music, church activities

WHAT DOES HISPANIC HERITAGE MONTH MEAN TO YOU? Honoring the many contributions of Latinos certainly helps build self-esteem and pride in those of us who identify ourselves as Hispanic Americans. Even more important, though, is the honoring of all ethnic diversities that make us a great country. By celebrating the many rich cultural and ethnic heritages that make us who we are, we encourage respect and appreciation for the uniqueness of others.

FAVORITE WORDS OF WISDOM After a particularly difficult past personal year, two sayings have come to have significant meaning for me. One was given to me by a wonderful friend and colleague, quoting Mother Teresa: "I know God won't give me anything I can't handle. I just wish He didn't trust me so much." I don't know the author of this other one: "I can handle anything that life throws at me – I may not be able to handle it well, or correctly, or gracefully, or with finesse, or expediently – but I will handle it." Good stuff to remember in times of challenges.



ROBERTO S. GALVEZ

TIME AT JSC 23 years

ORGANIZATION Space Shuttle Program Office, Flight Operations and Integration Office

POSITION TITLE Flight Manager

EDUCATION Bachelor of science in electrical engineering from Louisiana State University

PLACE OF BIRTH Panama City, Panama

HOBBIES Restaurant hopping, traveling and spending quality time with my family

WHAT DOES HISPANIC HERITAGE MONTH MEAN TO YOU? An opportunity to reflect on where we came from. Even though we have a different cultural background, we are able to live and work together and experience the great American dream.

FAVORITE WORDS OF WISDOM You control your future. Take advantage of the wonderful opportunities that you have each day and don't worry about circumstances that you cannot control. You'll sleep better at night.



DR. CHARLES RICHARD JUSTIZ

TIME AT JSC 23 years

ORGANIZATION Aircraft Operations Division of the Flight Crew Operations Directorate

POSITION TITLE Research Pilot

EDUCATION Bachelor of science from the U.S. Air Force Academy; master of science and doctor of philosophy from the University of Houston

PLACE OF BIRTH Miami, Fla. (I was born in the off-season)

HOBBIES Family, flying (of course), writing, biking, water sports

WHAT DOES HISPANIC HERITAGE MONTH MEAN TO YOU? We live in a country that is a richly seasoned brew with ingredients from all over the world. Hispanic Heritage Month allows us to become familiar with just one of the spices in our country's brew. We then come to the realization that even that spice is made up of many wonderful and exciting flavors.

FAVORITE WORDS OF WISDOM "Live as if you were to die tomorrow. Learn as if you were to live forever." – Gandhi



MIGUEL J. MAES

TIME AT JSC Seven years

ORGANIZATION White Sands Test Facility - Laboratories

POSITION TITLE AST Flight Systems Test Engineer

EDUCATION Bachelor of science in mechanical engineering; currently working on a master's in chemical engineering

PLACE OF BIRTH Santa Fe, N.M.

HOBBIES Horseback riding, hiking, fishing, camping, shooting, martial arts, playing the guitar, playing any sport, computer gaming and many other activities

WHAT DOES HISPANIC HERITAGE MONTH MEAN TO YOU? I think it's an opportunity to share the history, diversity and richness of all the people it takes to make a Hispanic culture. We are brown, we are black, and we are white. What makes us unique is that our culture is what binds us. It's an interesting thing to learn about!

FAVORITE WORDS OF WISDOM "Defeat never comes to any man until he admits it." – Josephus Daniels



MARIA R. TELLES

TIME AT JSC 12 years (started in El Paso)

ORGANIZATION Aircraft Operations Division Engineering Branch

POSITION TITLE Engineering Branch Secretary

EDUCATION Pursuing a business degree

PLACE OF BIRTH Cd. Juarez, Chih, Mexico

HOBBIES Tennis, restoring vintage war planes, being a volunteer counselor at the South Houston Crisis Pregnancy Center

WHAT DOES HISPANIC HERITAGE MONTH MEAN TO YOU? Hispanic Heritage means to me the enjoyment of the richness of life from the heart and soul. We are family-oriented and enjoy gathering with our families and loved ones to celebrate special events with the good flavors of food and music. Our colorful and unique culture can be seen all over the United States. The blending of our Hispanic ancestors has given us wisdom, compassion and feelings for our families and for others.

FAVORITE WORDS OF WISDOM Proverbs 3:5-6 – "Trust in the Lord with all thine heart; and lean not unto thine own understanding. In all thy ways acknowledge him, and he shall direct thy paths." (intuition, perception and discernment)

SPACE CENTER

Roundup

The Roundup is an official publication of the National Aeronautics and Space Administration, Johnson Space Center, Houston, Texas, and is published by the Public Affairs Office for all space center employees. The Roundup office is in Bldg. 2, Rm. 166A. The mail code is AP121. Visit our Web site at: www.jsc.nasa.gov/roundup/weekly/ For distribution questions or to suggest a story idea, please call 281/244-6397 or send an e-mail to roundup@ems.jsc.nasa.gov.

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